

**Notice of Allowability**

Application No.

10/828,911

Applicant(s)

SUZUKI, TATSUTOSHI

Examiner

Erica E. Cadugan

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to amendment of 8/14/2005 and interview of Oct. 21, 2005.
2. ☒ The allowed claim(s) is/are 1-12,14,15,41 and 42.
3. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some\* c) ☐ None of the:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

\* Certified copies not received: \_\_\_\_.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.

**THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.**

4. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.
5. ☐ CORRECTED DRAWINGS ( as "replacement sheets") must be submitted.
- (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review ( PTO-948) attached
- 1) ☐ hereto or 2) ☐ to Paper No./Mail Date \_\_\_\_.
- (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date \_\_\_\_.
- Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).
6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

**Attachment(s)**

- |   |   |
|---|---|
| 1. <input type="checkbox"/> Notice of References Cited (PTO-892)  | 5. <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)           |
| 2. <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)  | 6. <input type="checkbox"/> Interview Summary (PTO-413),<br>Paper No./Mail Date ____. |
| 3. <input checked="" type="checkbox"/> Information Disclosure Statements (PTO-1449 or PTO/SB/08),<br>Paper No./Mail Date <u>6/30/2005</u> | 7. <input checked="" type="checkbox"/> Examiner's Amendment/Comment                   |
| 4. <input type="checkbox"/> Examiner's Comment Regarding Requirement for Deposit<br>of Biological Material                                | 8. <input checked="" type="checkbox"/> Examiner's Statement of Reasons for Allowance  |
|   | 9. <input type="checkbox"/> Other ____.   |

### EXAMINER'S AMENDMENT

1. An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it **MUST** be submitted no later than the payment of the issue fee.

Authorization for this examiner's amendment was given in a telephone interview with Lyle Kimms on October 21, 2005.

The application has been amended as follows:

Claim 1 (Currently Amended). A turning tool for cutting circumferential grooves into a surface of a polishing pad formed of a resin material for polishing semiconductor devices, said turning tool comprising:

at least one plate-like shaped tool tip and

at least one cutting part extending from one side of the at least one tool tip,

wherein the at least one cutting part has a width within a range of 0.005-1.0mm, a wedge angle within a range of 15-35 degrees, and a front clearance angle within a range of 65-45 degrees, for cutting circumferential grooves into the surface of the resin polishing pad.

In claim 2, line 1, --at least one-- has been inserted prior to "cutting part".

In claim 3, line 1, --at least one-- has been inserted prior to "cutting part".

Claim 4 (Currently Amended). A turning tool according to claim 1, wherein said at least one tip includes a multiple number of the cutting parts arranged in a predetermined direction and [are] spaced apart by a pitch within a range of 0.2-2.0 mm.

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Claim 5 (Currently Amended). A turning tool according to claim 4, wherein the cutting parts are arranged in [a] the predetermined direction with regular pitches.

(NOTE: Claim 5, as amended in the 8/14/05 amendment, does not further limit claim 4 since claim 4 already set forth the limitation that “the cutting parts are arranged in a predetermined direction”.)

Claim 6 (Currently Amended). A turning tool according to claim 4, wherein said cutting parts are integrally formed at one edge portion of said at least one [too] tool tip so as to protrude outwardly from said one edge portion.

In claim 7, line 2, “tip” has been changed to --tips--.

Claim 9 (Currently Amended). A turning tool according to claim 1, further comprising a multiple number of said tool tips, each of the tool tips having said at least one cutting part, said tool tips being detachably fixed to each other.

Claim 13 has been canceled. (NOTE: claimed subject matter not shown.)

In claim 14, line 1, --at least one-- has been inserted prior to “cutting part”.

In claim 15, line 1, --at least one-- has been inserted prior to “cutting part”.

Claim 41 (Currently Amended). A turning tool according to claim 1, wherein said at least one tool tip includes a multiple number of the cutting parts arranged in a predetermined direction and the cutting parts are spaced apart by a pitch given by integral multiples of a pitch of concentric grooves to be formed into the surface of the polishing pad.

Claim 42 (Currently Amended). A turning tool according to claim 1, wherein said at least one tool tip includes a multiple number of the cutting parts arranged in a predetermined

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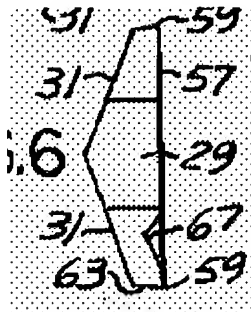
direction and the cutting parts are spaced apart by double a pitch of concentric grooves to be formed into the surface of the polishing pad.

2. The following is an examiner's statement of reasons for allowance:

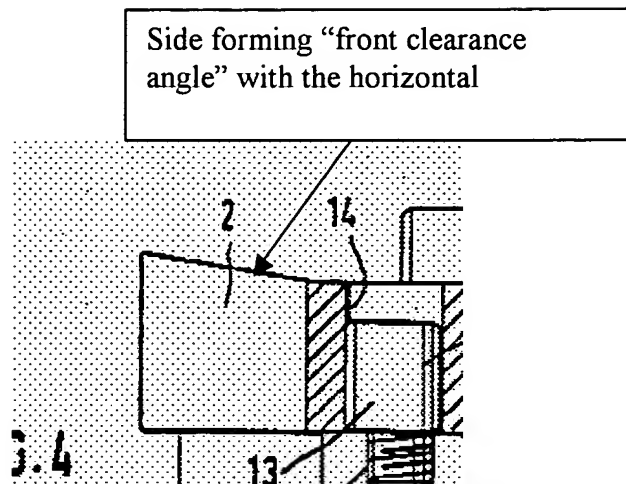
As set forth in independent claim 1, the present invention sets forth a turning tool that is "for cutting circumferential grooves into a surface of a polishing pad formed of a resin material and used for polishing semiconductor devices", the turning tool including (among other things) a "front clearance angle within a range of 65-45 degrees". The front clearance angle is shown in Figure 16B as element 04.

The references applied to the claims in the office action mailed 4/14/2005 (U.S. Pat. No. 4,063,841 to Niman, Jr., and U.S. Pat. No. 5,031,491 to Hoffman) are exemplary of the closest prior art of record to the present invention as set forth in independent claim 1. Suffice it to say, neither Niman nor Hoffman teach the "front clearance angle within a range of 65-45 degrees". Both Niman and Hoffman are silent as to the value of the front clearance angle.

As viewed in the partial reproduction of Figure 6 from the Niman reference below, the "front clearance angle" is the angle that the side labeled as "63" makes with the horizontal.



As viewed in the partial reproduction of Figure 4 below, the "front clearance angle" is the angle that the labeled side makes with the horizontal.



In neither of Niman nor Hofmann is this angle shown to be within the claimed range, noting that in both cases, the angle is clearly shown at an angle significantly less than 45 degrees.

In Applicant's response filed 8/14/2005 (page 9), Applicant asserts:

Referring to Figs. 4 and 5 of Niman and Figs. 2, 4, 6 and 8 of Hofmann, their turning tools have a very small clearance angle. On the other hand, as shown in Figs. 15B and 16B of the present specification, the claimed turning tool has a relatively large clearance angle within the range of 45-65°. This difference is important for cutting grooves onto the polishing pad, which has elasticity. The presence of a large clearance angle makes it possible to form grooves onto a resin polishing pad by cutting.

As shown in the attached Appendix 2 (attached), Explanatory View A, having a small clearance angle does not cause a frictional problem between the turning tool and the work surface of a hard material, such as metal, since it has no elasticity, and is not deformed by the pressure of the cutting edge. Therefore, a relatively small clearance angle would be desirable in the cutting edge to ensure durability in the turning tools of Niman and Hofmann.

In the case of the elastic material, such as the polishing pad, as shown in attached Explanatory View B, however, upon cutting grooves in the polishing pad, the polishing pad itself becomes deformed by the cutting edge pressure due to its elasticity. The small clearance angle of the turning tool causes a frictional problem between the cutting edge

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and the surface of the polishing pad. This can produce burrs or other defects in the walls of the grooves. Thus, the cutting tools of Niman and Hofmann can not cut grooves having a small-width and a small radius into the surface of the polishing pad. See paragraph 7 of the present specification.

Further, the present inventor found that the repeated friction between the cutting edge and the polishing pad creates a strong static electricity, causing cutting chip to undesirably stick to the cutting surface, causing more problems. It is therefore impossible for the conventional turning tools to cut grooves into a resin type polishing pad with dimensions required for polishing semiconductor devices needing a planarization in the micron order.

The present inventor found the abovementioned problems and invented a grooving tool with a novel configuration. As will be understood from attached Explanatory View C, a sufficient clearance angle within the claimed range of 45-65° is effective to avoid friction between the turning tool and the surface of the polishing pad, thereby eliminating the problems identified above, while making it possible to form fine circumferential grooves with a sufficiently small width and with a high dimensional accuracy.

Niman and Hofmann are completely silent about the problem created by the small clearance angle as stated above. In short, Niman and Hofmann would not have taught increasing the clearance angle. Applicant thus submits that there would not have been any motivation for Niman or Hofmann to configure the cutting tool as set forth in claim 1.

These arguments are persuasive. To summarize, specifically, because of the small front clearance angle shown by Niman and Hofmann, Applicant's line of reasoning about why the cutting tools taught by these references wouldn't be capable of performing the cutting of "circumferential grooves into a surface of a polishing pad formed of a resin material for polishing semiconductor devices" is persuasive. Additionally, Applicant has asserted a line of reasoning as to why the claimed range of clearance angles is critical to applicant's line of invention. Furthermore, Applicant has correctly and persuasively asserted that neither Neiman nor Hofmann teach nor provide any motivation for increasing the front clearance angle.

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Thus, for at least the foregoing reasoning, neither Niman nor Hofmann anticipate or render obvious the present invention as set forth in independent claim 1 including the “front clearance angle within a range of 65-45 degrees” in combination with the other claim limitations.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled “Comments on Statement of Reasons for Allowance.”

***Information Disclosure Statement***

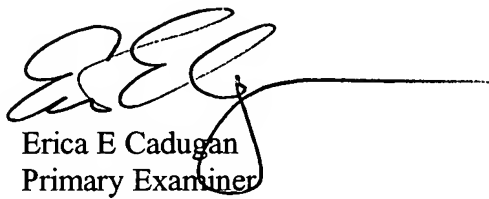
3. Examiner notes that U.S. Pat. No. 6,561,891 to Eppert, Jr. et al., cited on the information disclosure statement filed June 30, 2005, was lined through by the examiner because this reference was already made of record in the information disclosure statement filed April 21, 2004.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Erica E. Cadugan whose telephone number is (571) 272-4474. The examiner can normally be reached on M-F, 6:30 a.m. to 4:00 p.m., alternate Fridays off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner’s supervisor, Boyer D. Ashley can be reached on (571) 272-4502. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Erica E Cadugan  
Primary Examiner  
Art Unit 3722

ecc  
October 24, 2005